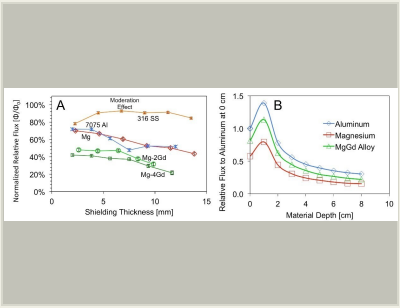
Small Business Innovation Research/Small Business Tech Transfer

Ultra-Lightweight Multifunctional Magnesium Alloy Shielding Structures, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

Radiation from GCRs and Solar Flares provide a hostile ionizing environment for personnel and vital electronic systems. The effects of this environment has been a topic of research for many years. Issues include the exposure for humans under acute and continuous exposures and the radiogenic cancer risk that rises with total dose and is a limiting constraint on long-duration missions. The proposed metal alloy development produces a material that is multi-functional and light-weight for deep space missions. The target material has a significant reduction in mass and potentially volume for protective performance such as radiation and debris shielding applications as well as potential performance thermally and acoustically. Development of these new Mg alloys will improve the margin and overall risk associated with each of these scenarios by improving the shielding performance and provides a reduction in the likelihood of electronic component failure occurrence as well as a reduction in consequence. Equally important, this will reduce the risk of cancer to personnel from radiation exposure. With respect to electronic systems, the systems that provide life support and are considered critical systems are vulnerable to the ionizing radiation effects as well. Once the "heavy" particles penetrate the electronic components, shorts are created in worst case conditions and provide temporary upsets in the best conditions. Similarly, those electronic systems that are considered non-critical, similar effects are seen but have consequences that effect the mission assurance aspects. By replacing existing metallic components with appropriate Mg alloys, such as the ones from this project, both vehicle weight and crew dose rate can be reduced. The operational benefits of such a change are manifold. For example, weight can be replaced with fuel to achieve greater vehicle velocity. Alternatively, mission duration could be extended while operating within equivalent dose limits.



Ultra-lightweight Multifunctional Magnesium Alloy Shielding Structures, Phase I Briefing Chart Image

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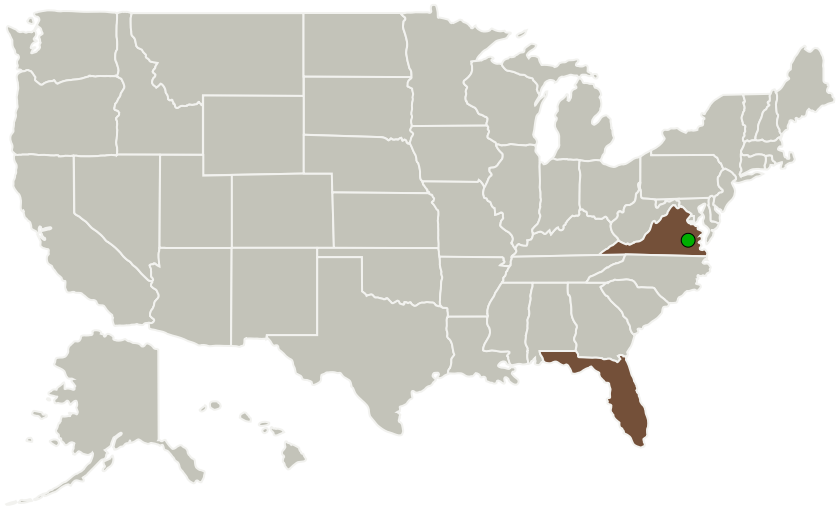
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Innovative Space Technologies, LLC	Lead Organization	Industry	Orlando, Florida
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Florida	Virginia

Project Transitions

June 2017: Project Start

December 2017: Closed out

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Innovative Space Technologies, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

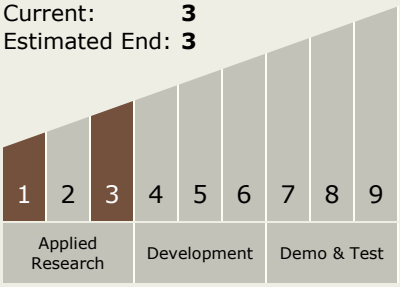
Carlos Torrez

Principal Investigator:

Keith Rhodes

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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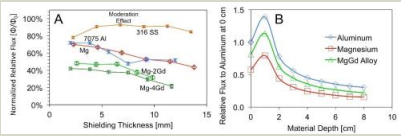
Images



Briefing Chart Image
Ultra-lightweight Multifunctional Magnesium Alloy Shielding Structures, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/131235)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.5 Radiation
    - TX06.5.3 Protection Systems

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System